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No. 112



HYDROGRAPHIC OFFICE

ILLUSTRATIVE CLOUD FORMS

FOR THE

GUIDANCE OF OBSERVERS

IN THE

CLASSIFICATION OF CLOUDS



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FROM THE

UNITED STATES GOVERNMENT

THROUGH

The Navy Department.

15 May, 1897.

U.S. - Bureau of Navigation - Hydrographic Office
No. 112



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NOTE BY THE HYDROGRAPHER.

The inadequacy of the old classification of clouds, either for identification or record, and the increasing attention given to clouds as signs for forecasting the weather, have led to the adoption of the present classification by the Hydrographic Office. The classification, nomenclature, and descriptive text are derived from the International Cloud Atlas, Paris, 1896, but the plates are from original paintings made for the Hydrographic Office. The standard classification includes ten cloud types which are shown on the first ten plates. Certain modifications of these types are shown on the remaining six plates. Rules for observing and recording are left for separate publications, as future development may suggest.

Each plate embraces the horizon and enough extension of view to show cloud perspective. The question of the adoption of a new classification, the collection of photographs and printed exemplars, the investigation of authorities and the form of publication, have been under the special charge of the Hydrographer. The original paintings are by Mr. Rudolf Cronau, who brings to the work an admirable spirit and an entirely satisfactory comprehension of the scientific and technical sides of the question. The paintings are derived from a large number of photographs provided by the Hydrographer, printed exemplars, the International Cloud Atlas, and from the artist's personal observation and knowledge of clouds. Mr. Cronau has had the advice of Mr. Louis Prang, the eminent lithographer, in respect to the quality of the pictures for reproduction. The lithographing is by L. Prang & Co., Boston.

The thanks of the Hydrographic Office are due to Mr. A. Lawrence Rotch, Director of the Blue Hill Meteorological Observatory and member of the International Cloud Committee, who, during the whole consideration of the subject by the Hydrographer, covering a period of three years, has given encouragement and advice; and to Mr. H. H. Clayton, of the Blue Hill Meteorological Observatory, who has criticised the paintings as they were produced, thereby enabling corrections to be made by the artist.

C. D. SIGSBEE,

Captain, U. S. Navy, Hydrographer.

U. S. HYDROGRAPHIC OFFICE, WASHINGTON, D. C., *April, 1897.*

CLASSIFICATION OF CLOUD FORMS

- a.* Separate or globular masses (most frequently seen in dry weather)
b. Forms which are widely extended, or completely cover the sky (in wet weather)

UPPER CLOUDS	Average altitude 9000 meters	<i>a.</i> 1. <i>Cirrus</i> <i>b.</i> 2. <i>Cirro-stratus</i>
INTERMEDIATE CLOUDS	Between 3000 and 7000 meters	<i>a.</i> 3. <i>Cirro-cumulus</i> <i>a.</i> 4. <i>Alto-cumulus</i> <i>b.</i> 5. <i>Alto-stratus</i>
LOWER CLOUDS	Altitude under 2000 meters	<i>a.</i> 6. <i>Strato-cumulus</i> <i>b.</i> 7. <i>Nimbus</i>
CLOUDS OF DIURNAL ASCENDING CURRENTS	Apex 1800 meters ; base 1400 met. Apex 3000 to 8000 ; base 1400 met.	8. <i>Cumulus</i> 9. <i>Cumulo-nimbus</i>
HIGH FOGS	Altitude under 1000 meters	10. <i>Stratus</i>

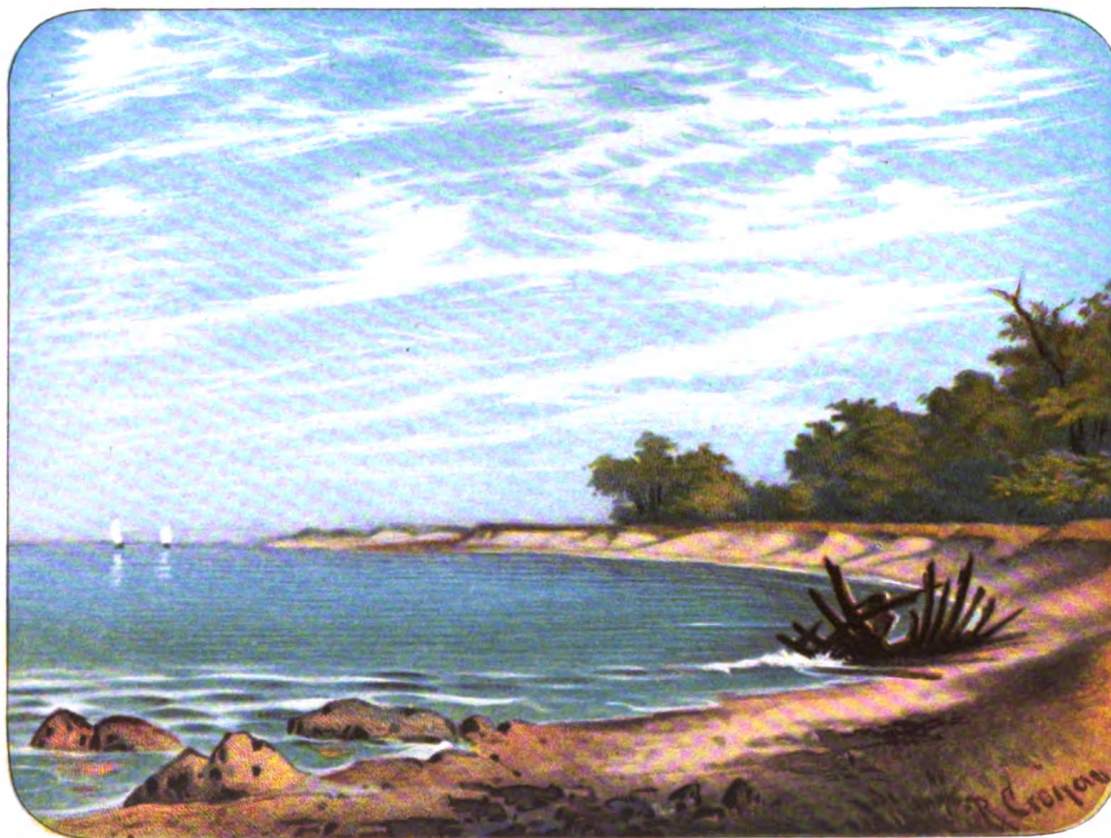


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Cirrus (Ci.).

Detached clouds, delicate and fibrous looking, taking the form of feathers, generally of a white color, sometimes arranged in belts which cross a portion of the sky in great circles, and, by an effect of perspective, converge towards one or two opposite points of the horizon (the Ci.-S., Plate II, and the Ci.-Cu., Plate III, often contribute to the formation of these belts).

PLATE I



CIRRUS (Ci)



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(Cirro-stratus Ci.-S.).

*A thin, whitish sheet, at times completely covering the sky and only giving it a whitish appearance (it is then sometimes called *cirronebula*), or at others presenting, more or less distinctly, a formation like a tangled web. This sheet often produces halos around the Sun and Moon.*

PLATE II



CIRRO-STRATUS (Ci-S)



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Cirro-Cumulus (Ci.-Cu.).

Small globular masses, or white flakes without shadows, or having very slight shadows, arranged in groups and often in lines.



CIRRO-CUMULUS (Ci-Cu)



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Alto-Cumulus (A.-Cu.).

Rather large globular masses, white or grayish, partially shaded, arranged in groups or lines, and often so closely packed that their edges appear confused. The detached masses are generally larger and more compact (changing to S.-Cu.) at the centre of the group; at the margin they form into finer flakes (changing to Ci.-Cu.). They often spread themselves out in lines in one or two directions.



ALTO-CUMULUS (A.-Cu.)

PLATE IV



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Alto-Stratus (A.-S.).

A thick sheet of a gray or bluish color, showing a brilliant patch in the neighborhood of the Sun or Moon, and which, without causing halos, may give rise to coronae. This form goes through all the changes like the Cirro-stratus, but by measurements made at Upsala, its altitude is one-half less.



ALTO-STRATUS (A-S) with patches of FRACTO-NIMBUS
See plate XVI

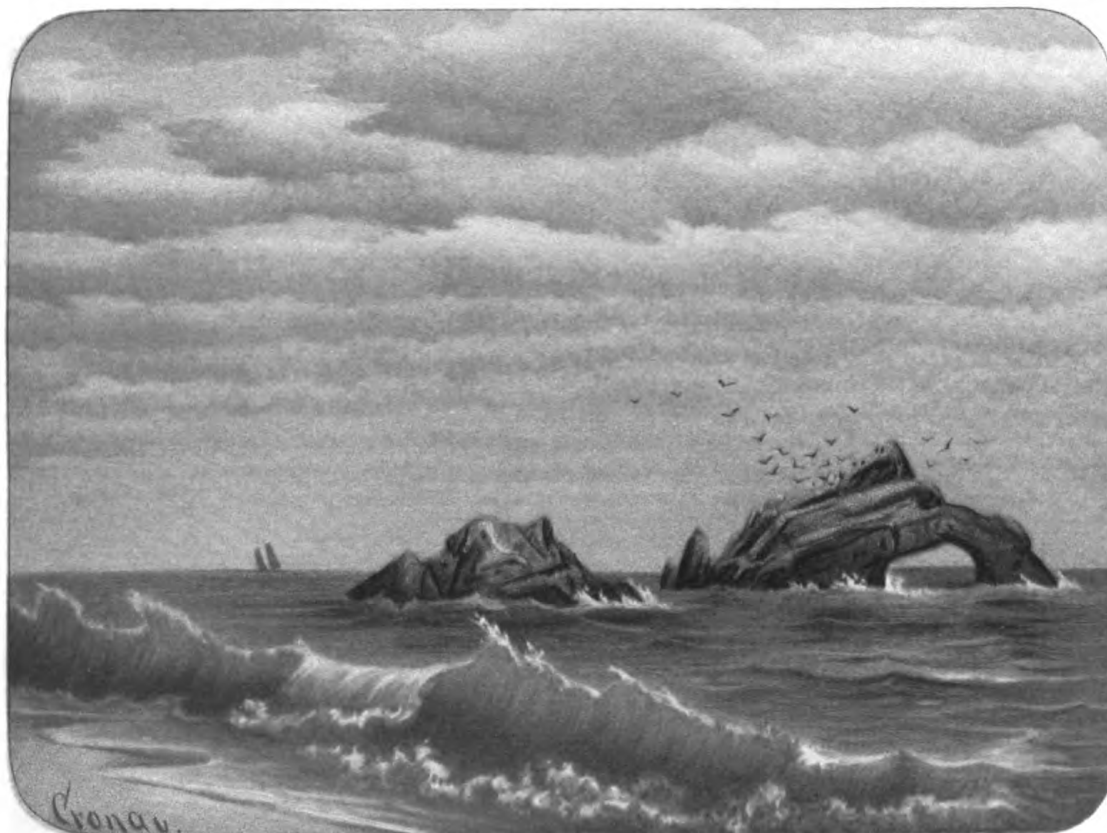


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Strato-Cumulus (S.-Cu.).

Large globular masses or rolls of dark cloud, frequently covering the whole sky, especially in winter, and occasionally giving it a wavy appearance. The layer of Strato-cumulus is not, as a rule, very thick, and patches of blue sky are often visible through the intervening spaces. All sorts of transitions between this form and the Alto-cumulus are noticeable. It may be distinguished from Nimbus by its globular or rolled appearance, and also because it does not bring rain.

PLATE VI



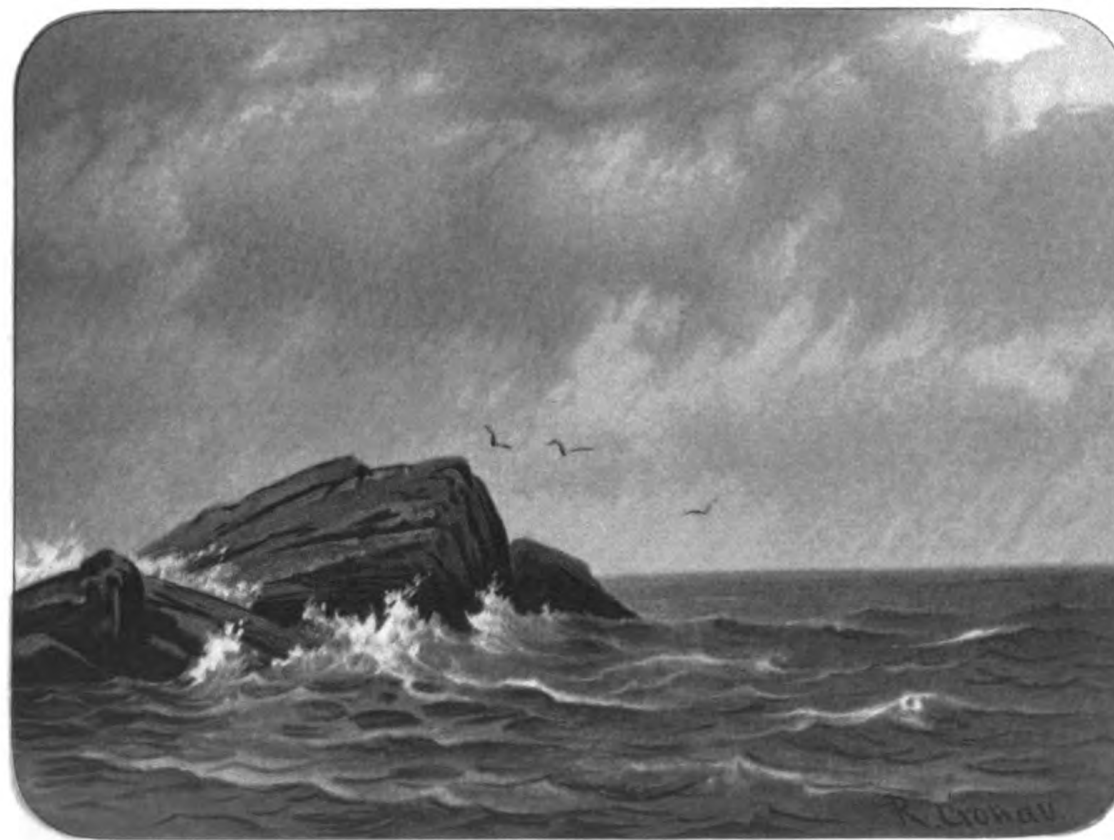
STRATO-CUMULUS (S.-Cu) See plate XV



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Nimbus (N.).

Rain-clouds. — A thick layer of dark clouds, without shape and with ragged edges, from which continued rain or snow generally falls. Through the openings in these clouds an upper layer of Cirro-stratus or Alto-stratus may almost invariably be seen. If the layer of Nimbus separates into shreds, or if small loose clouds are visible floating at a low level, underneath a large Nimbus, they may be described as *Fracto-nimbus* (*Fr.-N.*). "Scud" of sailors, Plate XVI.



NIMBUS (N) See plate XVI

PLATE VII



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Cumulus (Cu.).

Wool-pack clouds. — *Thick clouds of which the upper surface is dome-shaped and exhibits protuberances while the base is horizontal.* These clouds appear to be formed by a diurnal ascensional movement which is almost always observable. When the cloud is opposite the Sun, the surfaces usually presented to the observer have a greater brilliance than the margins of the protuberances. When the light falls aslant, these clouds give deep shadows; when, on the contrary, the clouds are on the same side as the Sun, they appear dark, with bright edges.

The true Cumulus has clear superior and inferior limits. It is often broken up by strong winds, and the detached portions undergo continual changes. These may be distinguished by the name of *Fracto-Cumulus* (*Fr.-Cu.*), Plate XII.

Cumulus sometimes presents a mammillated lower surface, as shown on Plate XIV. It is then called *Mammato-Cumulus* (*M.-Cu.*).



CUMULUS (Cu) See plates XII, XIII and XIV



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Cumulo-Nimbus (Cu.-N.).

The Thunder-cloud; Shower-cloud. — Heavy masses of clouds, rising in the form of mountains, turrets, or anvils, generally having a sheet or screen of fibrous appearance above ("false Cirrus") and underneath, a mass of cloud similar to "Nimbus." From the base there usually fall local showers of rain or of snow (occasionally hail or soft hail). Sometimes the upper edges have the compact form of Cumulus, forming into massive peaks round which the delicate "false Cirrus" floats, and sometimes the edges themselves separate into a fringe of filaments similar to that of the Cirrus cloud. This last form is particularly common in spring showers.

The front of thunder-clouds of wide extent frequently presents the form of a large bow spread over a portion of the sky which is uniformly brighter in color.



CUMULO-NIMBUS (Cu.-N)

PLATE IX



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Stratus (S.).

A Horizontal Sheet of lifted Fog. —
When this sheet is broken up into
irregular shreds by the wind, or by
the summits of mountains, it may
be distinguished by the name of
Fracto-Stratus (Fr.-S.). Plate XI.



PLATE X

STRATUS (S) See plate XI



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Fracto-Stratus (Fr.-S.).

When *Stratus*, Plate X, is broken into irregular shreds by the wind, or by the summits of mountains, it may be distinguished by the name *Fracto-stratus*.



FRACTO-STRATUS (Fr-S) See plate X

(Supplementary) PLATE XI



HYDROGRAPHIC OFFICE

Fracto-Cumulus (Fr.-Cu.).

The true *Cumulus*, Plates VIII and XIII, has clear superior and inferior limits. It is often broken up by strong winds, and the detached portions undergo continual changes. These may be distinguished by the name *Fracto-Cumulus*.



FRACTO-CUMULUS (Fr.-Cu) See plates VIII and XIII



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Cumulus (Cu.).

Another example of the *Cumulus*
type shown on Plate VIII.



(Supplementary) PLATE XIII

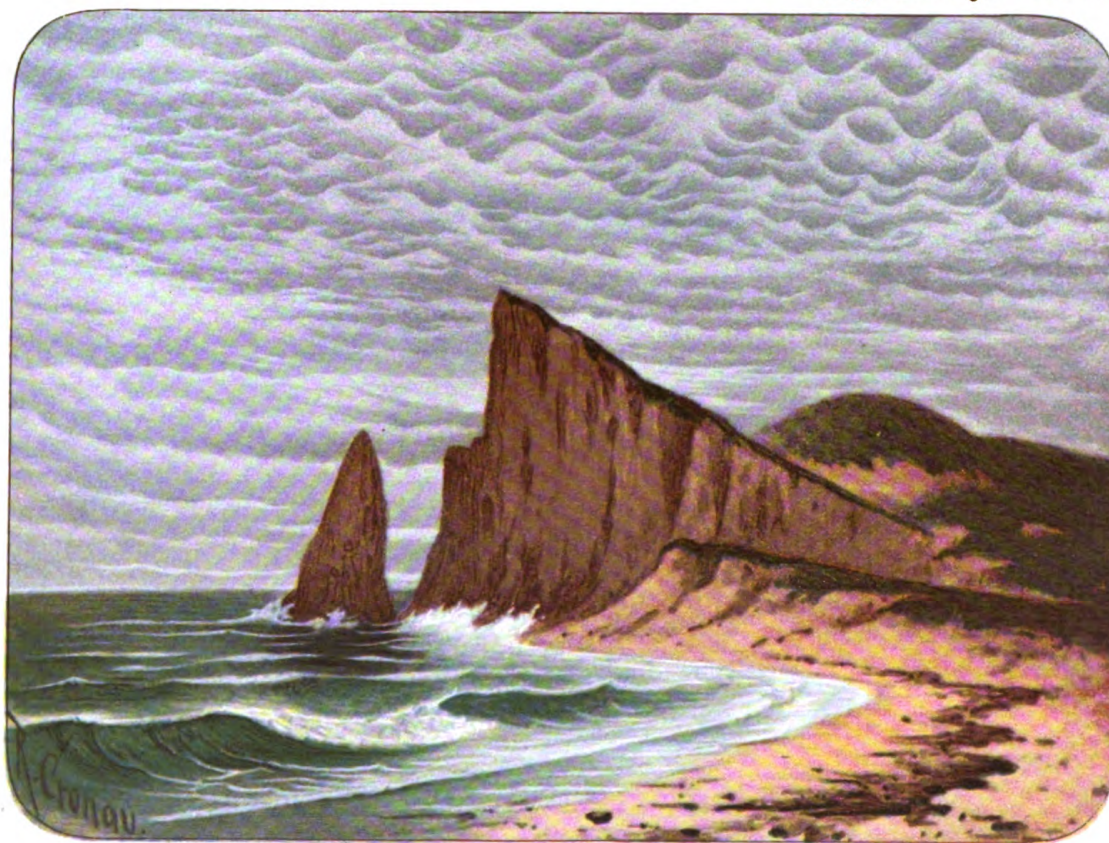
CUMULUS (Cu) See plates VIII, XII and XIV



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Mammato-Cumulus (M.-Cu.).

Cumulus, Plates VIII and XIII, sometimes presents a mammillated lower surface. It is then called *Mammato-Cumulus*.



MAMMATO-CUMULUS (M-Cu)

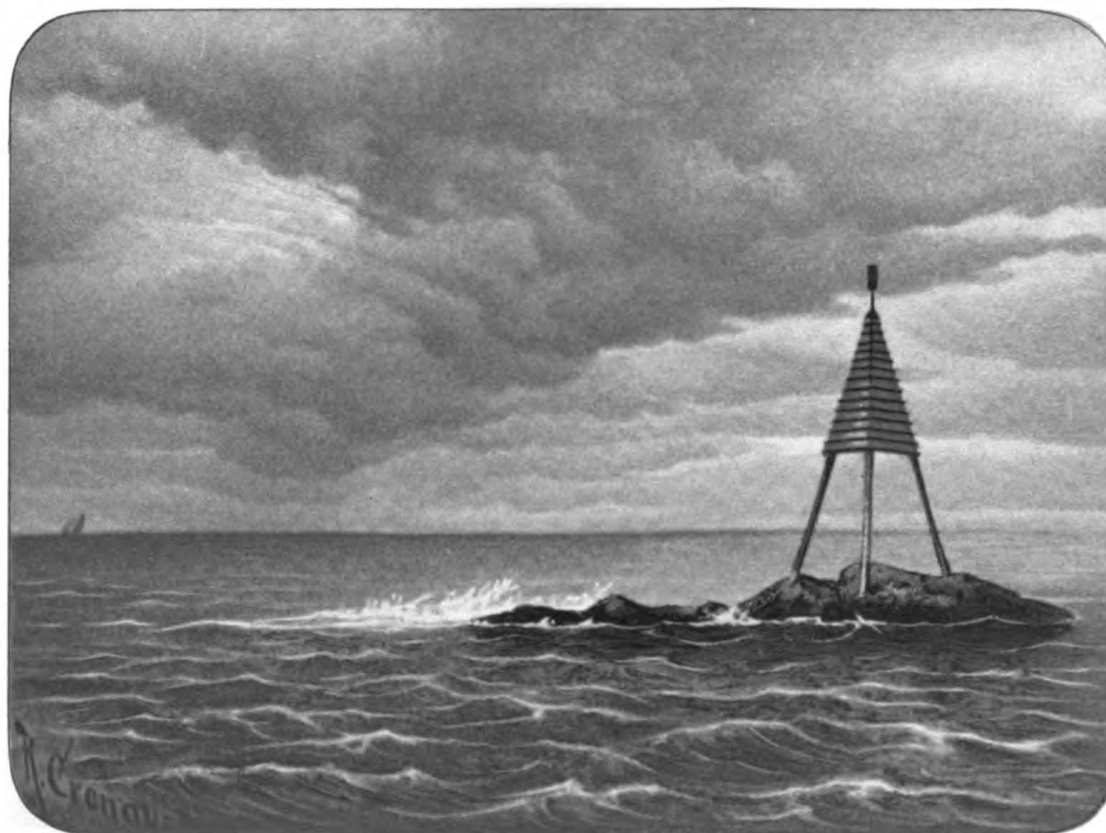
(Supplementary) PLATE XIV



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**Strato-Cumulus (Low)
(S.-Cu.).**

Another example of the *Strato-Cumulus* type shown on Plate VI.



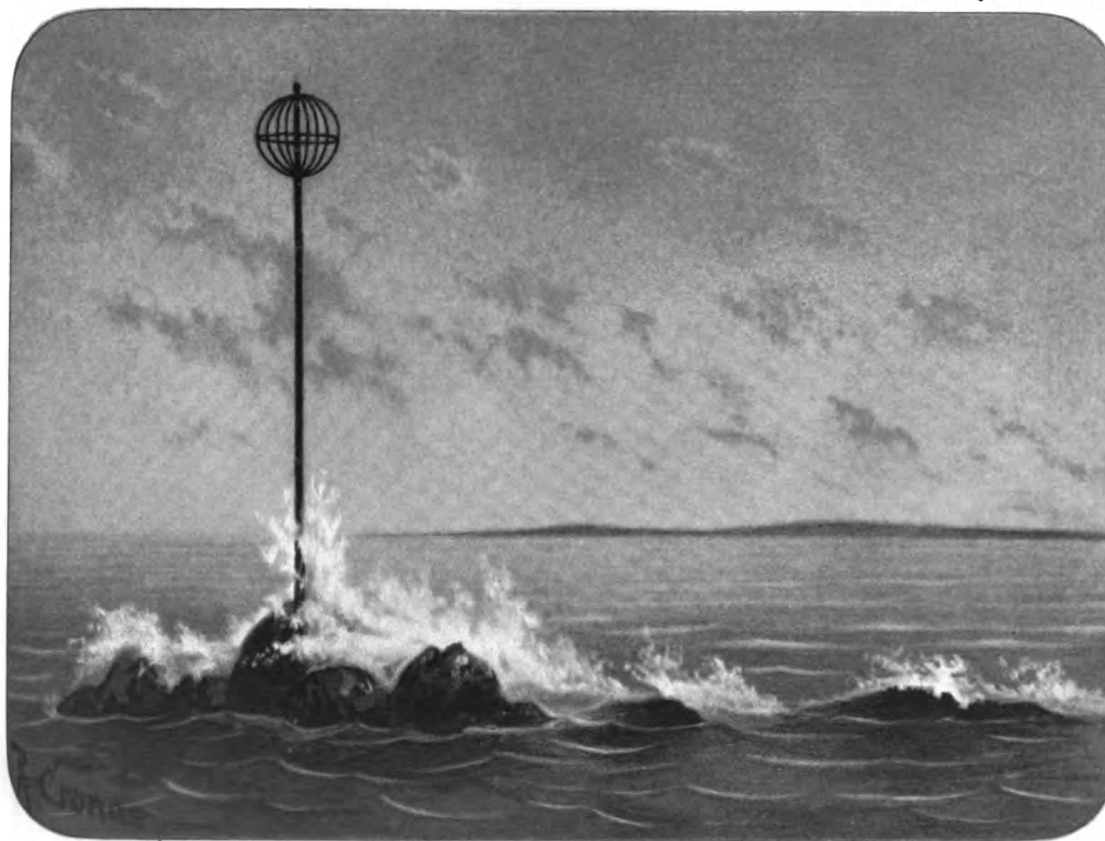
STRATO-CUMULUS, LOW, (S.-Cu) See plate VI



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Fracto-Nimbus or "Scud"
(Fr.-N.).

If the layer of *Nimbus*, Plate VII, separates into shreds, or if loose clouds are visible floating at a low level underneath a large *Nimbus*, they may be described as *Fracto-Nimbus*. "Scud" of sailors.



FRACTO-NIMBUS or "SCUD" (Fr-N)

(Supplementary) PLATE XVI

